sPHENIX EMCal

Module production R&D at BNL

SEAN STOLL

UIUC sPHENIX EMCAL WORKFEST 8/2015

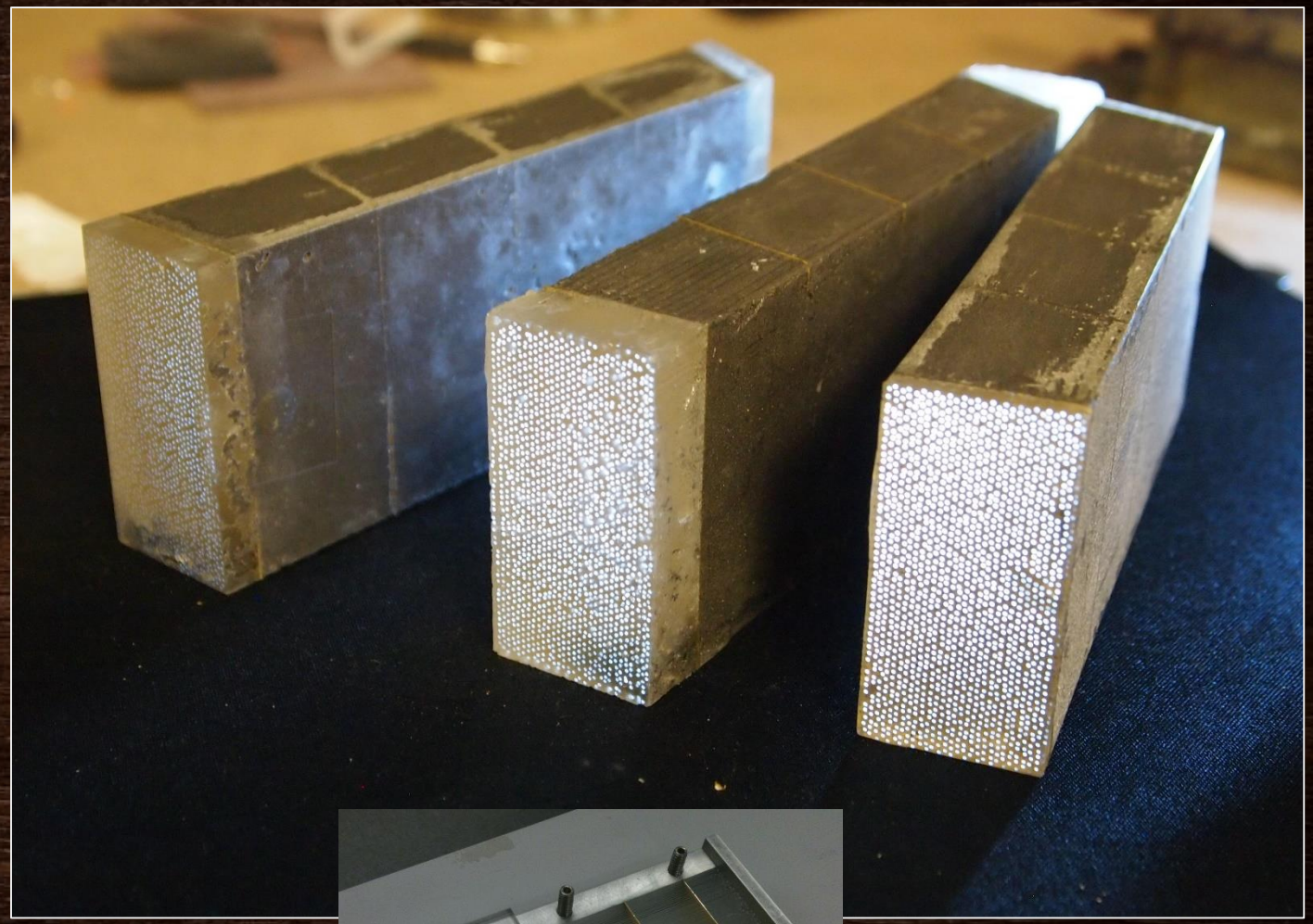
Progress

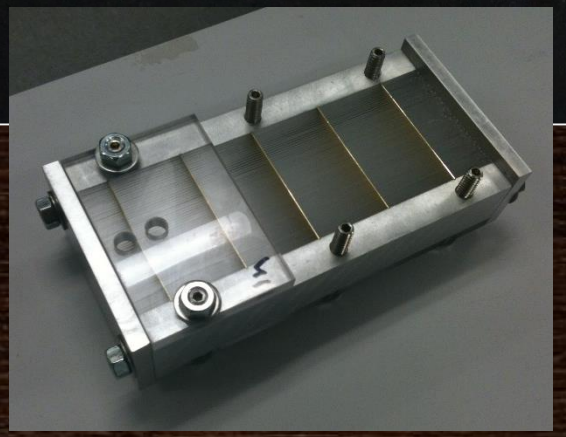
- Since producing our first module in February, we have produced:
- five 1D tapered, 2 tower modules
- three 2D tapered, 1 tower modules

- developed molds and 2 different techniques for producing modules:
  - stepped meshes
  - tilted wire frames
- worked out fiber/screen filling procedure and developed fixtures for production

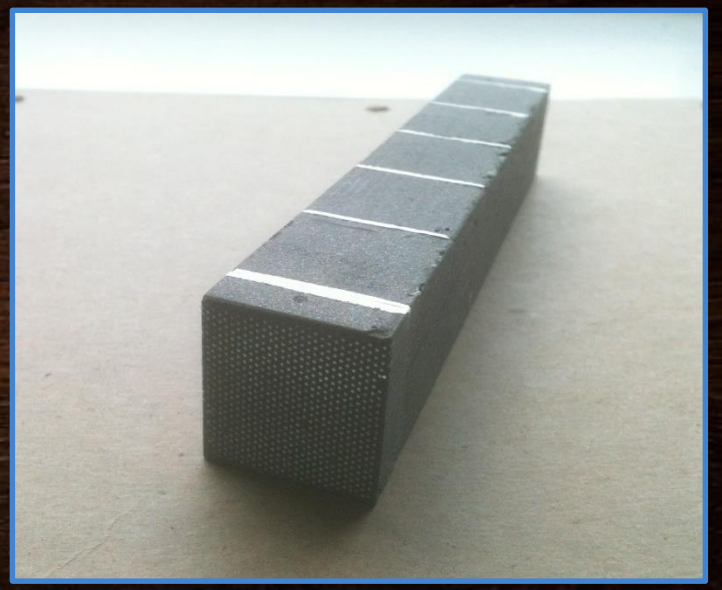
We have produced 5 modules at BNL so far, but have slowed the production of 1-D projective modules.

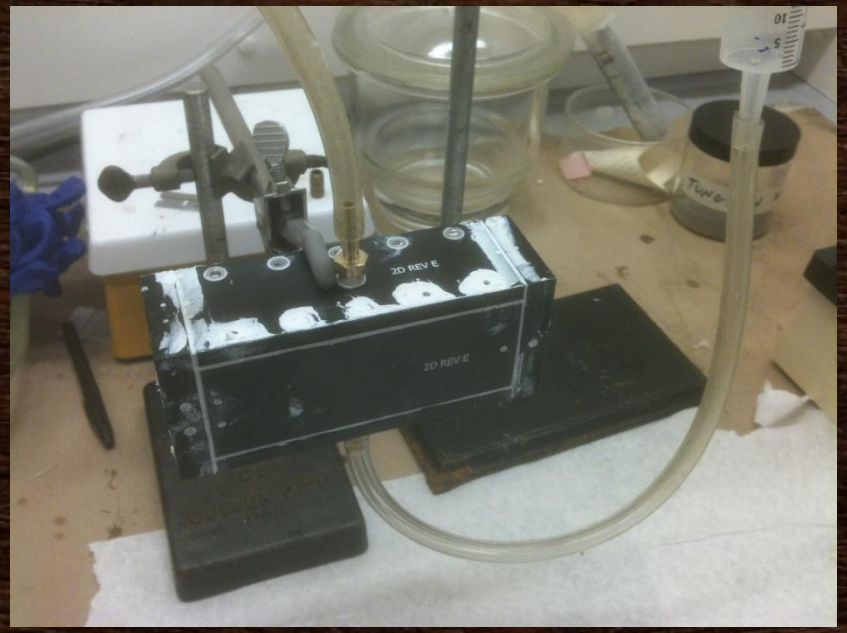
Still some issues:
- bubbles/vacancies in clear ends
- surface finish
- fiber position uniformity?
- module densities ~ 9.6-9.7 g/cm^3 (W/fiber/epoxy region)
- density uniformity?
- W cubes density ~12g/cm^3

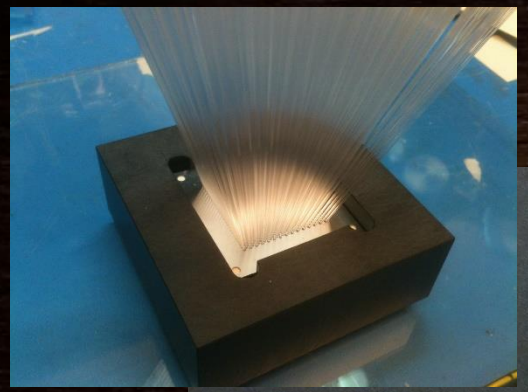


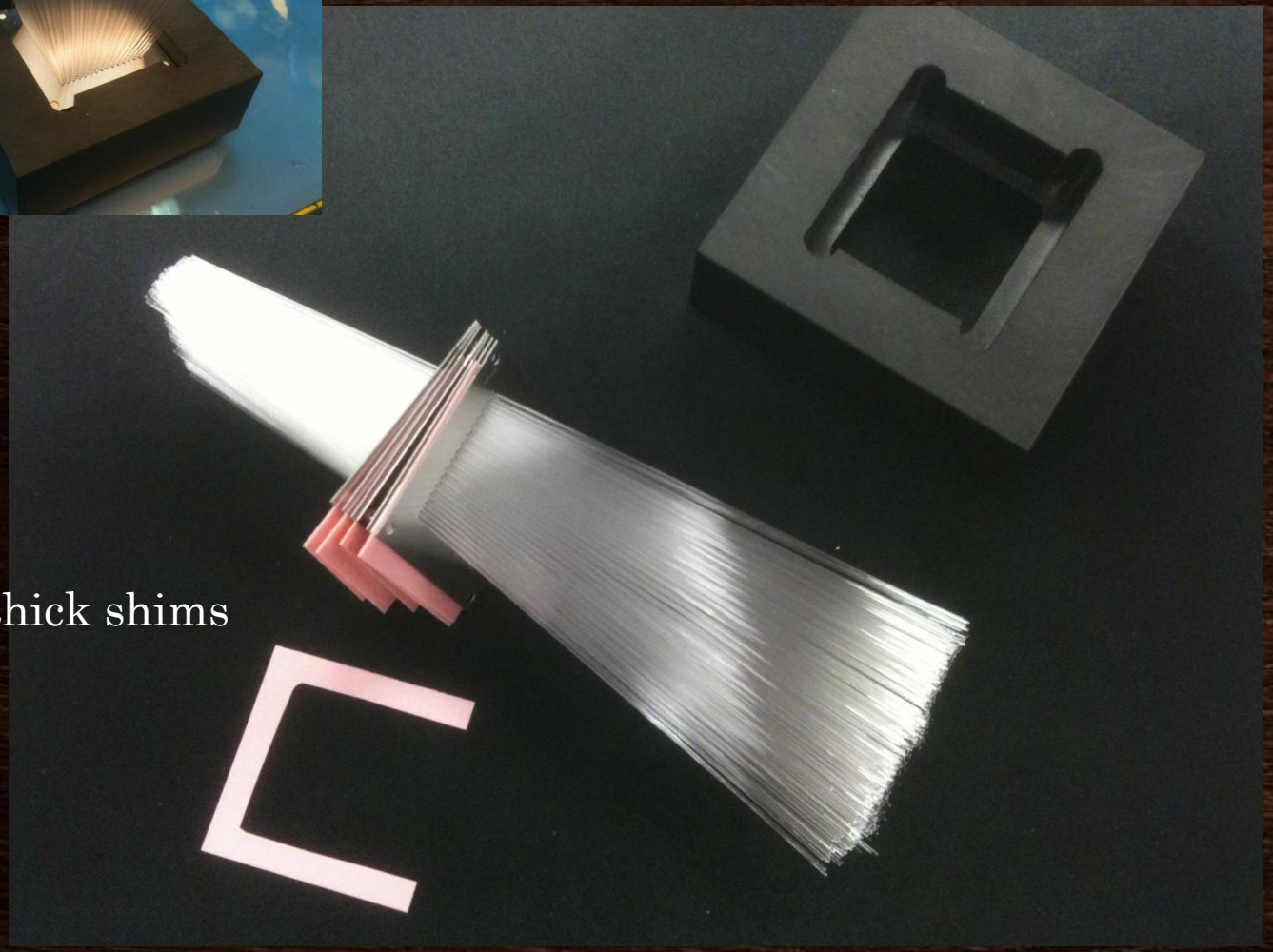


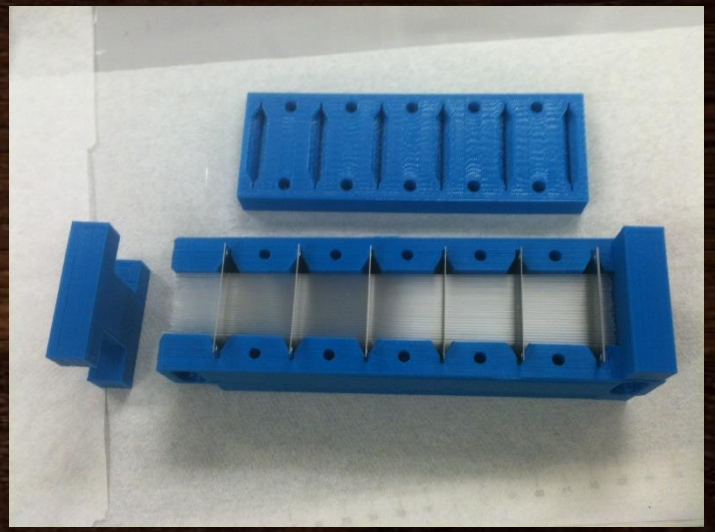
- 2D tapered module production
- made progress with mold design
- much tighter fit – no leaks
- still had some trouble getting module out of mold
- densities low: ~ 9 g/cm^3
- readout end finishing/polish

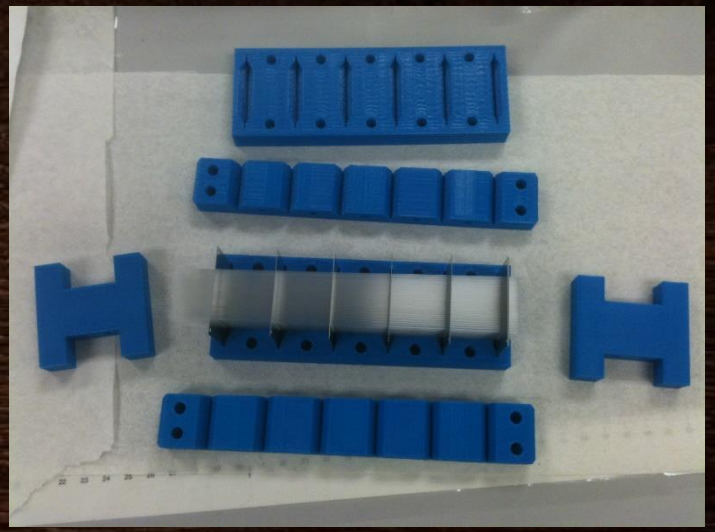








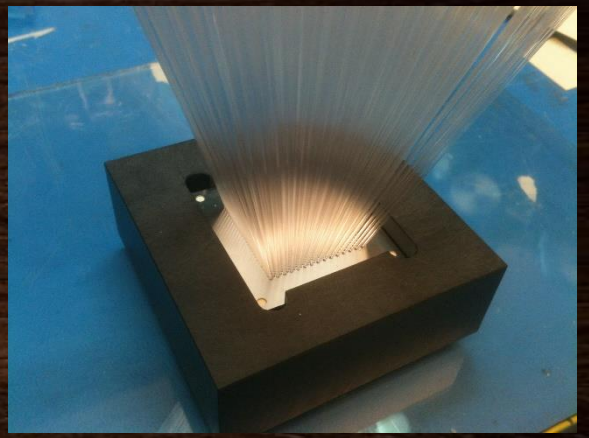




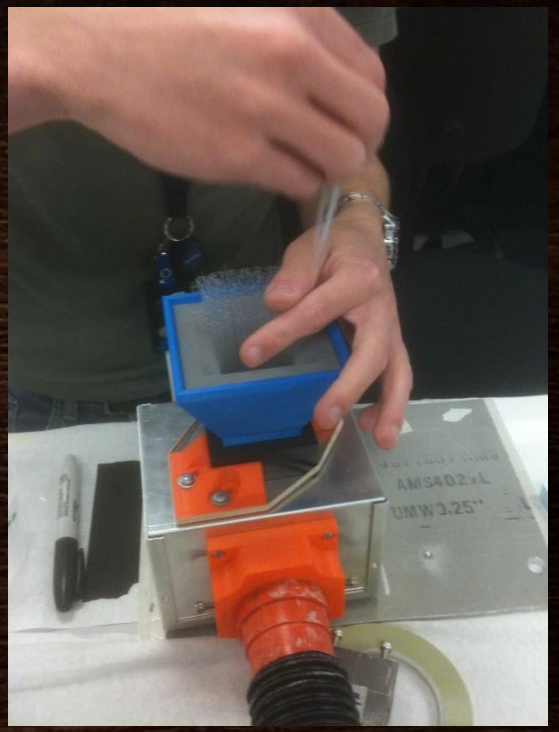
0.015” thick shims

fiber/screen filling of 2D projective module manufacturing

Refining process for loading fibers into screens



- Tuning shim spacing between screens
- Added a funnel/hopper to facilitate loading
- Tuned funnel pitch with shim spacing
- Added vacuum attachment



- Loading times consistently < 10 min for stepped screens,
- faster for “straight through” screens and wire frames

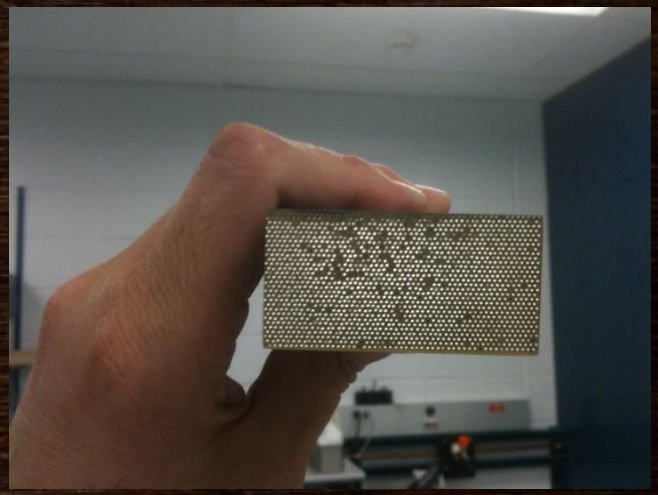
- Scaleable to 2x2 tower modules? – tune shim spacing, hole size/shape

TILTED WIREFRAMES

- Made initial proof of principle fixture
- filled stacked wire frames with fibers and inserted into fixture
- filling procedure seems non-problematic
- fiber positioning looks good
- sent drawings to be printed

Modules received from THP

- 1D tapered modules – 3 received to date
- they have improved their process, but have problem registering the module for machining without damaging fibers.
- discussed relaxing dimension tolerances for testbeam modules



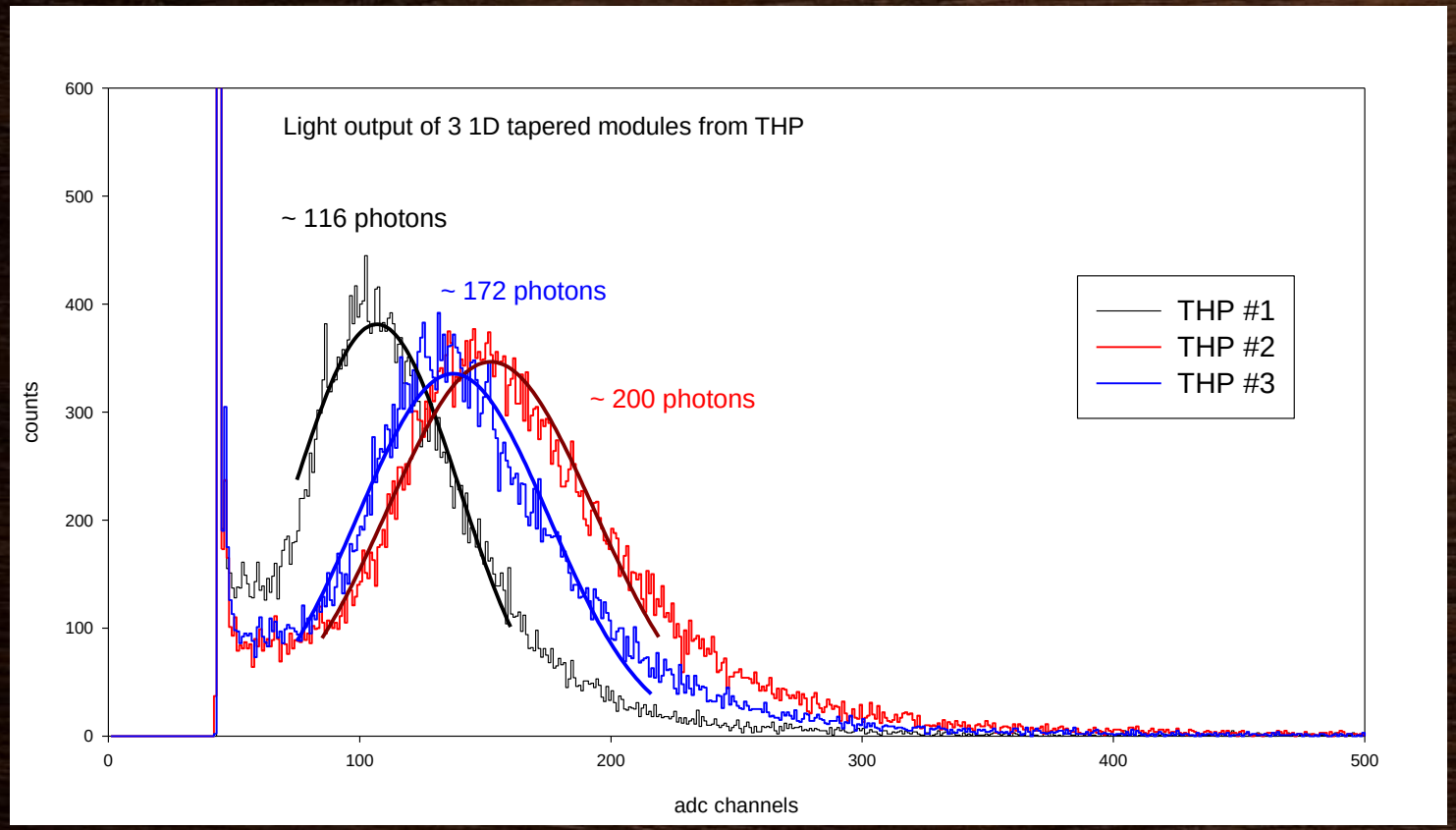
Tungsten/fiber modules from Tungsten Heavy Powder.

- Received 3rd module

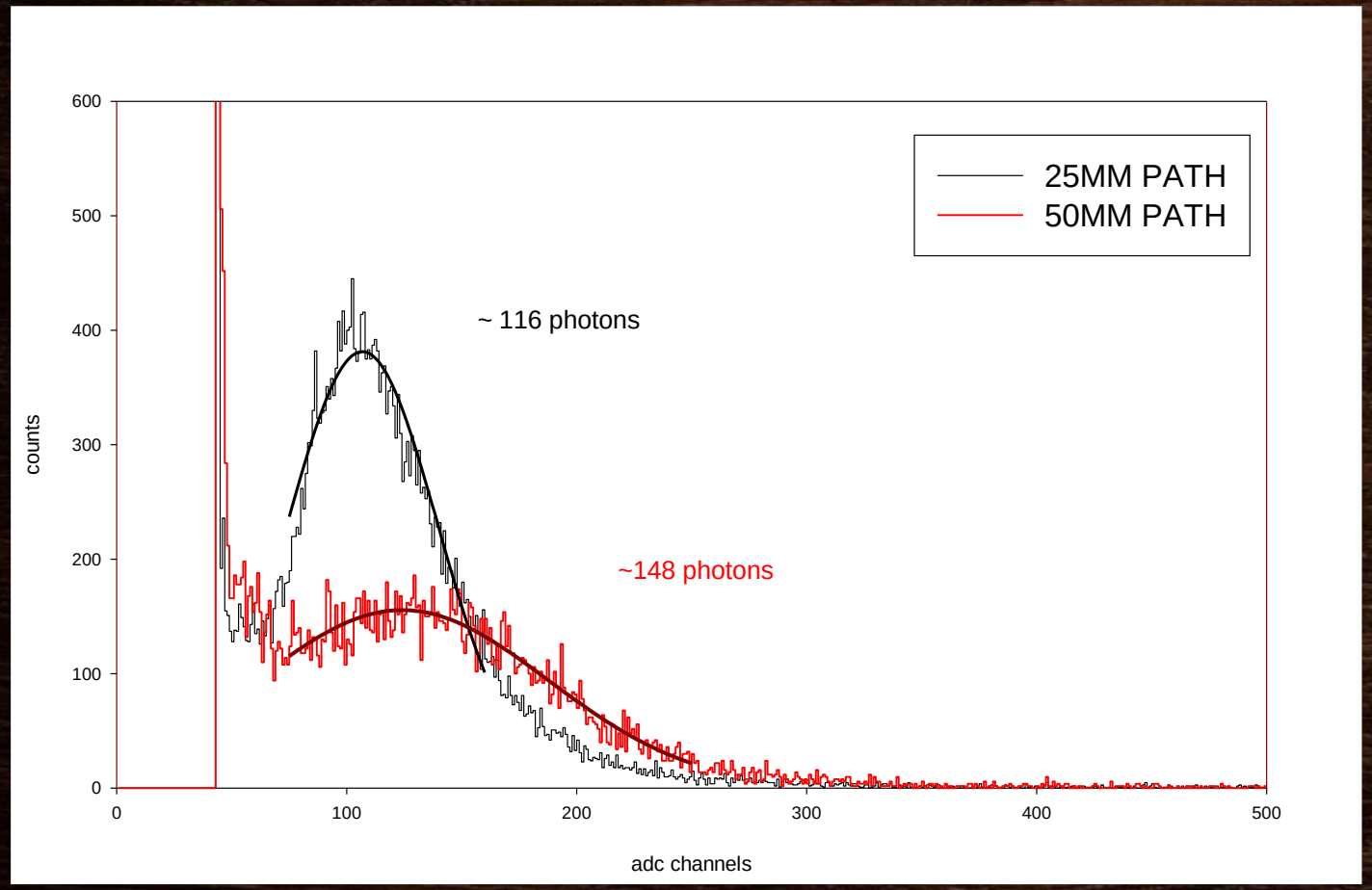
- Density is similar to others
- Problem with machining of fibers – damaged perimeter fibers
- Surface finish different from previous 2 samples?
- Fiber fill – 100%
- Fiber positioning – good
- Screen alignment - good

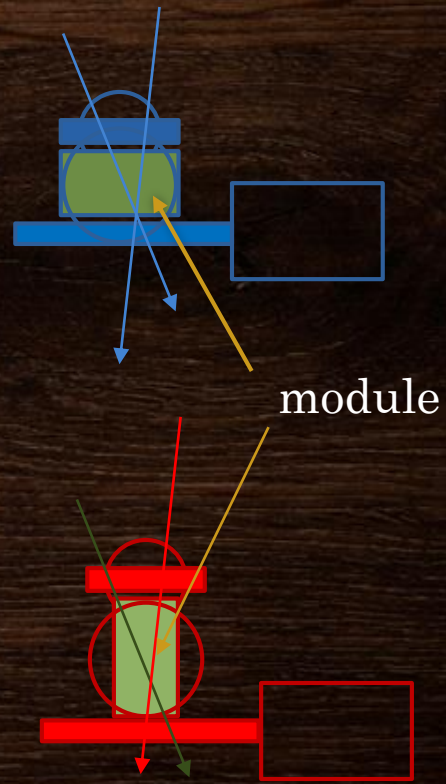
	Module #		
	I	II	III
module weight (g)	1699	1716	1682
module avg density (g/cm3)	9.07	8.98	8.96
W/epoxy region density (g/cm3)	9.75	9.63	9.74

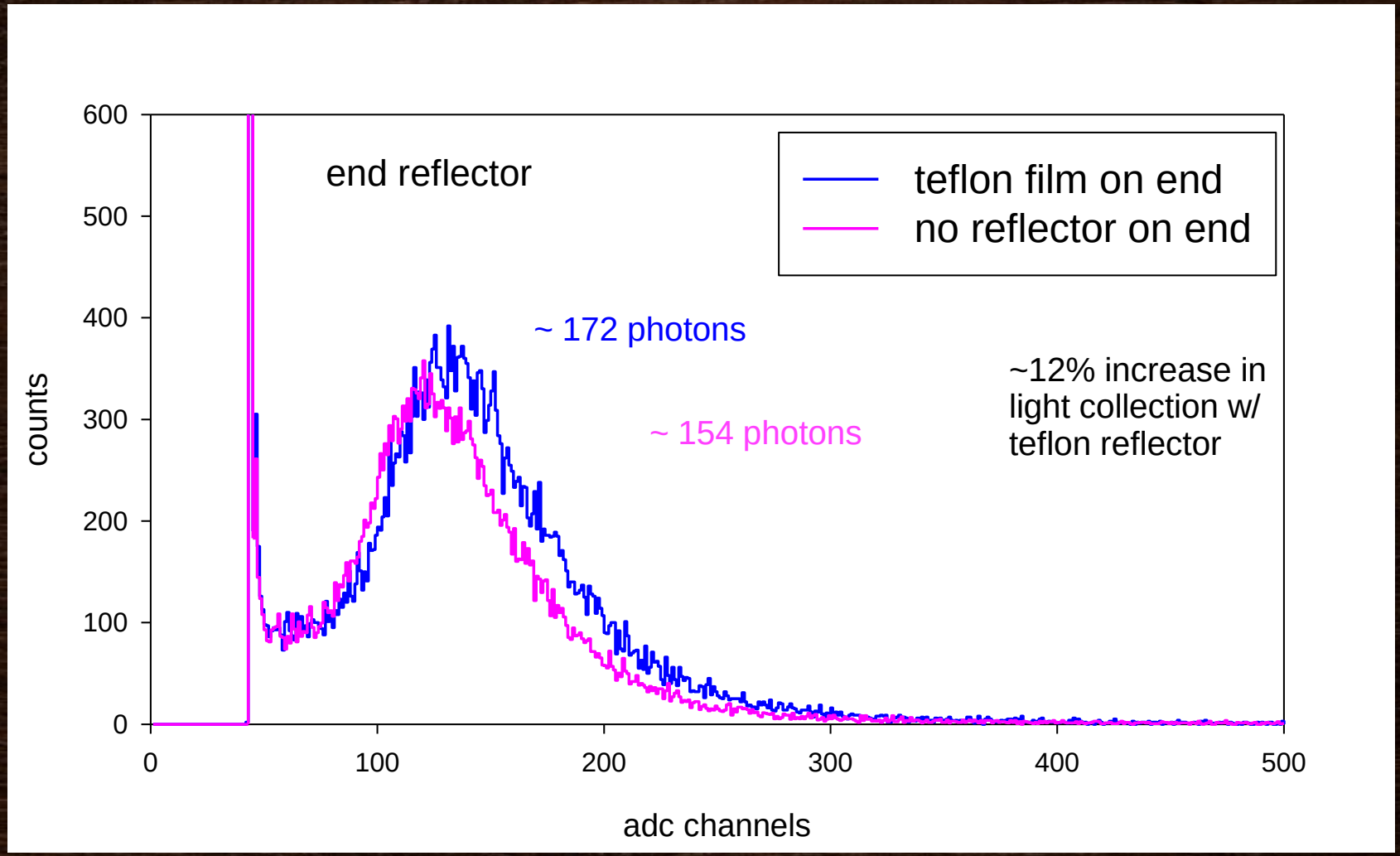
Measured light output of sample modules from THP

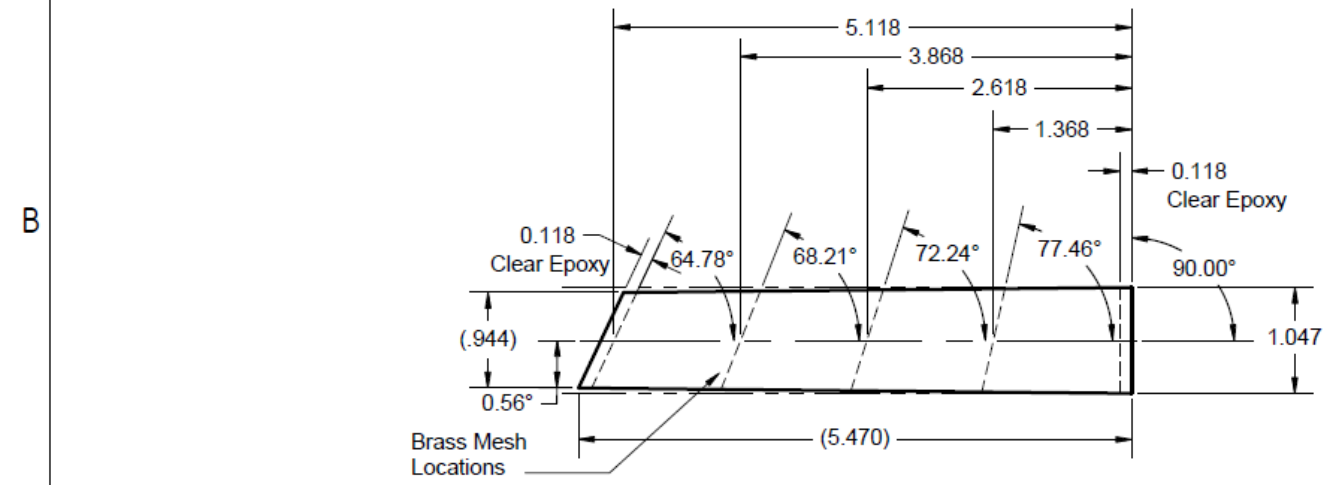


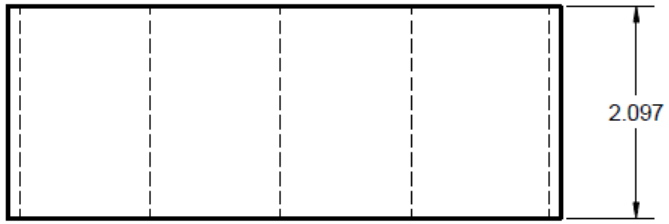
Measured light output of sample modules from THP






end reflector
teflon film on end
no reflector on end
~ 172 photons
~ 154 photons
~12% increase in light collection w/ teflon reflector
counts
adc channels
0
100
200
300
400
500
600





			REV
			SHEET
REVISION STATUS OF SHEETS			

THIRD ANGLE PROJECTION

INTERPRET IN GENERAL ACCORDANCE WITH ASME Y14.5M-1994
UNLESS OTHERWISE SPECIFIED:
ALL DIMENSIONS ARE IN DECIMAL TOLERANCES
X.X ± .06
X.XX ± .015
X.XXX ± .005
ANGLES ± .25

FINISH MAX. BREAK EDGES MIN.

NEXT ASSEMBLY

DRAWN BY:	C. Pontieri	1/15/2015
CHECKED BY:	R. Ruggiero	
ENGINEER APPROVAL:	C. Woody	1/15/2015
Q.A. APPROVAL:		1/15/2015
SAFETY ENGINEER:		

BROOKHAVEN NATIONAL LABORATORY
Upton, NY 11973

PROJECT: sPHENIX
SYSTEM: EMCAL
MODEL/DRAWING NAME: 2 x 1 Block

SIZE	DRAWING NUMBER:	REV.
A	SP0-000-030	A

Q.A. CATEGORY:	SCALE:	WEIGHT:	SHEET 1 OF 1

New module drawing 8/2015